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GLOBAL WEATHER SERVICES IN 2025: UPDATE ON THE VISION[1]

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"By 2025 the data problem for weather prediction will be solved. Global weather prediction models with 1 km horizontal resolution will have reached the theoretical limits of predictability theory. Numerical predictions in the 0-2 day time frame will be essentially perfect."

So begins *Global Weather Services in 2025,* a multimedia presentation that projects 25 years into the future[2]. It is an optimistic look at what the weather services of 2025 will be and illustrates a number of concepts with video images of real and model data.

The stool of modern weather forecasting has three legs: (1) scientific understanding, (2) global observations, and (3) computer forecast models. As the three legs have been strengthened by the advent of computer models and satellites since the 1950s, the accuracy of weather forecasts has gradually improved. However, there remain weaknesses in the process as practiced today—the three legs of the stool all have limitations, and the stool is, therefore, somewhat wobbly. My talk presents an update on the progress made toward achieving the vision, with emphasis on the essential role of satellites in strengthening the second leg of the stool.

Weaknesses in the global observing system include horizontal and temporal gaps in the observations, errors, non-representativeness, and inadequate vertical resolution of the sounding systems. Thus the three-dimensional picture of the atmosphere that is the basis for stepping forward into the future is imperfect, sort of like a fuzzy photograph with imperfectly described features and even some important missing ones.

Advances in the capability to observe the atmosphere will improve to eliminate the errors and gaps in the data that now exist. A mixture of satellites, radars, balloons, aircraft, and ground-based systems will provide observations over the entire globe with an accuracy and resolution that will produce crisp, clear, and complete pictures of the atmosphere, oceans and land at all times.

By 2025 the global satellite observing system will include of order ten large geostationary and polar orbiting satellites and several constellations of small satellites in polar orbits. The observations from this system when analyzed together and assimilated in models will produce highly accurate analyses of temperature, pressure, water vapor and winds from the stratosphere to the Earth's surface in all weather, resolving the atmosphere on horizontal scales of tens of kilometers, vertical scales of about 100 m and temporal scales of an hour or less.

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[1] Presented at the GOES Users Conference II. Boulder, CO, Oct. 1-3, 2002. Based on a longer paper on this topic presented at the Centennial Celebration of Nanjing University, May 21, 2002.

[2] For further information please see http://www.ucar.edu/pres/2025/index.html